

# DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

*Edited by L. Russell Muirhead*

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# DISCOVERY

A Monthly Popular Journal of Knowledge

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## Notes of the Month

THE isolation of a new type of hydrogen is the outstanding discovery of the month. It is described as "heavy hydrogen" and has been given the name of diplogen; a unit of heavy hydrogen has been called a diplon. This element exists in minute quantities, and its isolation, by three American physicists, is a remarkable achievement. It has been determined that there is one part only of heavy hydrogen to 35,000 parts of light hydrogen. As a correspondent to *The Times* points out, to discover that the familiar element hydrogen is really a mixture has produced in scientific circles a shock akin to the discovery of Lord Rayleigh that argon was present in the atmosphere. Protons (the nuclei of light hydrogen) have already been used for the bombardment of the atom in an attempt to produce transmutation, and the diplon is likely to have even more interesting results in view of its greater weight. In California a method has already been devised for speeding up the nuclei electrically by whirling them round in a vacuum. This method had earlier been applied to protons and was recently used with great success in the case of diplons. As far as practical applications are concerned, heavy hydrogen is of unusual interest in the fields of medicine and physiology. It has been shown that water containing heavy hydrogen has properties very different from those of ordinary water. Experiments have proved that water composed of heavy hydrogen and oxygen will not support life; it is

reported to cause the death of tobacco seeds, fish, tadpoles and worms.

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A long-debated question as to whether the admitted difference in mentality between "primitive" and civilized peoples is one of kind or only of degree has been revived. Dr. H. L. Gordon has examined the heads and brains of a number of male natives in Kenya Colony and gives the results of his work in a letter to *The Times*. In recent years argument on this question has proceeded on psychological lines. Dr. Gordon's investigations bring debate back to physical and racial characters and the thorny question of their relation to mental ability. The question is of far-reaching practical importance. If it were possible to reach a definite conclusion, it would have crucial significance in determining native policy in our dependencies—in matters affecting education and social and political regulation. From an examination of the heads of 3,444 unselected male natives of Kenya Dr. Gordon has calculated that they have an average skull capacity of 1,316 cubic centimetres; the average in Europeans is 1,481 cubic centimetres. It was also observed that while in the European there is a marked and continued rise in skull capacity after puberty, in the African the increase ceases at that age. Further the examination of 100 brains of normal adult Kenya males yielded an average of 150 grammes less than the average of the European brain.

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These figures unquestionably point to the inferior size of the African brain. The fact that the capacity of the Kenya skull was calculated from measurements taken from the living introduces an element of uncertainty; but the general result is confirmed by the examination of the actual brains. Are we then to conclude from these figures that the African is racially and constitutionally inferior to the European in a sense which cannot be affected by education. The significance of the size of the skull and brain in relation to mental ability has been questioned. It is pointed out that many prehistoric and "primitive"

skulls show a larger capacity than the average skull of modern civilized man; while men of marked ability in modern times have had very small heads. It has been suggested that mental ability is a matter not of the size of the brain but of its quality. Here again Dr. Gordon's observations are of great significance. His colleague Dr. Vint, Government Pathologist at Nairobi, reports that the cortex or grey matter of the brains examined shows a deficiency quantitatively of 15 per cent as compared with that of Europeans, while the cells of the cortex are smaller, less well-formed and less well-arranged than in the European. Dr. Gordon further points out that while it was believed that dementia paecox never occurred among natives living in primitive conditions, he encountered a number of cases among Kenya natives. On following these up he discovered that all of them had received some kind of European education. While there are a number of points in Dr. Gordon's report upon which an anthropologist would seek further information, the importance of the conclusions to which his investigations lead is such as to call for further and extended enquiry.

\* \* \* \* \*

In this issue Mr. Marshall Sisson contributes to the series on contemporary design an article on the future of Western architecture. He surveys a wide field in this country and in Europe. Another well-known architect has recently made some interesting comments on modern London buildings and the way in which they reflect our social scheme. He compares eighteenth century architecture in London—the spontaneous expression of an orderly social system—with the modern scheme, which he likens to a geological area, with frequent faults and bulky intrusions from one stratum to another. We share Mr. Marriott's satisfaction with the increasing number of buildings based upon a definite utility, material or "moral," reasonably well adapted to future progress. The headquarters of the London Passenger Transport Board at St. James' Park, for instance, is obviously planned suitably for its function and the new stations of the Underground Railway are designed with an appropriate response to local surroundings.

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"Suitability to purpose" is clearly important in the design of hospitals, and this is being increasingly recognized by modern architects. Mr. Marriott mentions the new Freemasons' Hospital as really taking into account the mental and moral aspects of healing. It is only in this way that a hospital building can be truly "functional." We wish it were more widely recognized that "there is nothing from the

layout of roads and railways to the design of petrol pumps that is not strictly an architectural problem." There is much in modern architecture that is neither pleasing nor useful. New materials have afforded opportunities for fantastic treatment; and we agree with Mr. Marriott that many buildings in London come near to the limit of toleration. But Mr. Sisson says that already fashions in design are passing and modern architects are evolving standards which will compare with the best achievements of the past.

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The possibilities of a transatlantic air route were discussed by Mr. J. L. Naylor in *Discovery* last month. The survey carried out by the British Arctic Air Route Expedition did much to pave the way for a regular route between Europe and America, and this work has been continued during the past year by the Pan-American Airways East Greenland Expedition. The British Expedition showed that, while flying conditions in East Greenland are extremely good in the summer, blizzards frequently reaching a speed of a hundred miles an hour would hamper aircraft in the winter. But as these conditions were thought to be local, the problem of the weather was not insurmountable. If two bases were established at different points on the east coast of Greenland, aeroplanes could use one or the other according to the weather. It would probably be possible to fly over the storm, although landing would be difficult. Mr. Watkins, who before his death planned the Pan-American Airways Expedition, chose for his base a small fjord a hundred miles north of Angmagssalik (the main Danish colony) which is suitable for the largest type of aircraft. Pan-American Airways also sent another expedition to West Greenland where extensive flying trials were carried out. The future of the Arctic air route will depend on the data collected from all these expeditions.

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In addition to the mapping and meteorological work undertaken by the Expedition, time was found to study the flora and fauna of the country. A study of the birds reveals the fact that a great number are non-breeding species; and as this seems to have no connexion with the food supply or whether it is a good or a bad ice year it represents an interesting problem for ornithologists. When collecting plants members of the expedition came unexpectedly across what is described as an oasis of plant life at the head of a fjord north of Angmagssalik, which contained several species not previously known to exist so far north.

## Science and Religion—III.

## What Is the Issue?

By Hilaire Belloc.

*Mr. Belloc describes the real issue between science and religion as a conflict between two opposite moods, from which proceed two opposing methods of discovering Truth. This conflict, he suggests, will increase in violence until one or the other conquers, or until the two separate so thoroughly as to dominate separate sections of mankind.*

THERE is an issue set between science and religion; that is, a conflict. On this, modern men have no doubt. Now what is that issue? We must try and define it or we cannot deal with it.

## Two Conflicts.

There is no conflict between two abstract conceptions which may be labelled the one "Science," the other "Religion." If we mean by "Science" the body of ascertained and measurable physical things, and by "Religion" a sentiment of awe towards something adored and the acceptance of moral commands recognized by all men through the conscience, the two sets of ideas can hardly conflict, because they are not in touch with one another. It is true that the body of ascertained physical things may include facts—such as madness—which preclude freewill and therefore deny morals where these facts apply; but as between the vague sentiment to which men attach the word "Religion" in general, and a body of ascertained physical facts, there is no issue.

But a conflict arises at once when we attach to religion a particular meaning including certain affirmations in contradiction to ascertained physical facts, or when we mean by "Science," not the body of ascertained physical facts but a whole method of regarding cause and effect and the nature of the world. Of the first form of conflict the most obvious is the conflict between an historical affirmation imposed by some religion and an ascertained fact contradictory of that affirmation. For instance, if a man's religion includes the affirmation that man first appeared on earth six thousand years ago, there is a mass of ascertained fact which makes this statement so improbable that it may be called impossible. Of the second form of conflict, the most obvious example is the denial by the scientists (in practice) of miracle, that is, of interruption in the sequence of observed physical cause and effect.

But the real issue lies not in some logical differences of this kind, but between two opposing moods, from which proceed (and which are partly caused by them) two opposing methods of attaining Reality; of discovering Truth; of Believing. For when modern

men say, "Science says this," they mean by "Science," not the body of ascertained fact but a whole method of arriving at truth, and what is more, a whole state of mind inimical to another state of mind, also existing in the modern world. They mean "the scientific spirit" as opposed to that other spirit, or mood, which may best be called "the religious spirit." Between these two there is indeed a conflict, and it will act with increasing violence until the one or the other conquers, or until the two separate so thoroughly as to dominate separate sections of mankind.

The scientific spirit, then, relies on the authority of certain dogmas. These dogmas scientists rarely explain or even attempt to base them upon reason. The scientist takes them for granted and is angry to hear any contradiction of them. The first and most important of these dogmas is the unity and self-sufficiency of the material universe and therefore the immutability of sequence in cause and effect. The second dogma is that the only form of proof certainly acceptable to the reason of man is proof through things measurable, proof capable of repetition and therefore of test by experience. Truth thus ascertained (says the scientific spirit) is certain; all other affirmations are negligible. Such is the Authority from which the Scientific Spirit derives its creed.

## Personal Judgment.

The Religious Spirit, on the other hand, relies on a personal judgment whereby it accepts the authority of an Institution, a book, or a spiritual intuition. Its conclusions are not subject to any universal test, as are those of the scientific spirit. It says, "this Institution is holy and clearly speaks with a Divine voice" or "this book contains all important truth" or "I once experienced this or that within. Such an experience stands fast and nothing external can overthrow it."

Now as between these two, since there is conflicting authority, there is conflicting method; the scientific spirit deals with a number of isolated phenomena, and as it proceeds in its investigation, sets out on a number of divergent lines. It produces the specialist who is not to be contradicted but who cannot co-ordinate his

results with other specialists, save at the very beginning of his journey. The religious spirit on the other hand relies on a general judgment. The first deals in what may be called differentials, an indefinitely large and increasing number of separately acquired truths. The second deals with integration. The first tends to the error of confusing hypothesis with fact. The second tends to strict deduction from what it is sure of, and therefore the error of deducing an apparently certain conclusion from insufficient premises.

### Facts and Theories.

An example of the first error was the affirmation of Natural Selection as the agent of growth. It was but an hypothesis; common sense could see that it was not at work in the real world (an acorn does not become an oak by natural selection) and also that it was in contradiction with the first laws of arithmetic: for with every succeeding generation selective advantage diminishes in geometrical proportion. An example of the second form of error is the statement that because men are born equal, therefore each is equally fitted to decide upon affairs of state.

The quarrel between these two moods, (1) religious appreciation or apprehension, doctrines appealing to the revelation of conscience or the authority which conscience has discovered to be supreme, and (2) doctrines derived from the unproved postulates of the Scientific Spirit, spreads, as time proceeds, throughout all the activities of human life. For example, the good of the body is a thing appreciable to all and measurable by all, the physical facts in connexion with it can be affirmed without hesitation and receive universal acceptance. Thus, physical pain is an evil, whatever relieves it must therefore be a good. The scientific spirit tends in this particular department to the limitation of childbearing, to the painless murder of those suffering from a painful and incurable disease.

There is no doubt whatever on the facts. They who maintain that pain must be borne, though avoidable, and that life is sacred, rely upon some authority not subject to immediate physical and universally accepted experiment. Each sort of man is equally certain of his position; each must become the mortal enemy of the other; for each is inevitably compelled to combat the activity of the other as being something abominable. He who defends the thesis that we must, for spiritual reasons, submit to pain and permit others to suffer it, is abominable to the scientific spirit. He who would put to death the incurable, sterilise the unfit, sacrifice traditional morals in the effort to relieve pain, or raise the average of health, is, to his religious opponent, diabolical.

As with this example, so with all the others. To the scientific spirit marriage is a contract, necessarily tending to be more and more easily determinable at will. To the religious spirit marriage is a sacrament; desecrated if it be reduced to a mere contract like other terminable human contracts. To the scientific spirit in history, the document is conclusive, tradition and our common sense are negligible. To the religious spirit the whole known nature of man is called in as witness to fact, and the document is always suspect and weak compared with that integration. To the scientific spirit positive affirmation upon beauty and the plastic arts or upon morals is absurd. To the religious spirit such affirmation is the upholding of essential and central truth.

I have said that the conflict is certain to increase. It will increase in area and in violence. Those who, from a weakness of soul, like to believe that there can be a reconciliation between such opposites have not considered the nature of the case. Those who believe that the battle is already won, do not understand their opponents. They are under-estimating their enemies. In this country, with much the greater part of men to-day, or at least with much the greater part of men who think clearly and closely upon these affairs, the battle does seem at least three-quarters won by the scientific spirit, and the remainder of the action will be no more than the "cleaning up" which follows successful assault.

I make no doubt that the future, when we consider European civilization as a whole, will gravely disappoint this view. The religious spirit has begun its counter-offensive. On the ultimate effect of this I will prophecy nothing. But that such a re-action is now in progress—and increasingly formidable—should be apparent to anyone who can look beyond the boundaries of his own nation.

### Our Growing Language.

The number and variety of words which have been added to the English language since the war is emphasized by the publication of the new supplement to the Oxford Dictionary.

Although the industrial and social life of England has made innumerable contributions to the language in the last few years, the world of science has probably exceeded both, and such words as proton, neutron and now diplon have been introduced during the past year or two. Art has added cubism and futurism; and the United States of America, whose capacity for new words passes all belief, is responsible for talkies, racketeer, wisecrack and hooey.

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## New Birds from Africa—I.

By David A. Bannerman, M.B.E.

British Museum (Natural History).

*During the last two years British ornithologists have been active in many distant parts of the world, particularly in Africa. Some of the important discoveries made are reviewed by the author, whose article will be concluded next month.*

THE writer is often asked by interested inquirers, "Surely there are no more new birds to discover?" and though it is seldom indeed to find a new bird so remarkable as one recently sent to me from the Belgian Congo,\* yet new birds are sometimes discovered, though their numbers must necessarily become fewer every year.

Foremost among the expeditions which have left our shores within the last two years, judged by the value of the information brought home and the novelty of the collections obtained, must be mentioned that undertaken to Portuguese East Africa by Mr. Jack Vincent on behalf of the British Museum. The colony of Mozambique, as it is more correctly termed, has for long been somewhat of a blank to ornithologists, and it was realized that an energetic collector

with experience would have a grand field for his labours, once the initial difficulties were overcome. Jack Vincent left England in the summer of 1931 and spent a full year in the Portuguese colony. He made splendid use of his time and sent home to the British Museum first class study material, the results of which have but recently been made known.

Blantyre, in Nyasaland, was used as the first base, for it had the advantage of lying in British Territory and of being the chief commercial centre of Nyasaland from which supplies and personnel could best be obtained. A Ford lorry thereafter became the mobile

\*A shrike with a yellow head and black body, utterly unlike any known species in the world, which was brought home to a Belgian museum, by a gentleman who had collected this single specimen and no other bird on his travels.

"base camp," for even in this still but little traversed part of Africa, mechanical transport has taken the place of porters of former safari days. Undoubtedly, as Vincent proved to his satisfaction, this method of collecting holds many advantages, for in a colony such as Mozambique, where part of the country

traversed was bare of habitations, the difficulty of supplying a large safari with food would have seriously hindered progress. As it was the collector found that he was able to work a much greater extent of country than would otherwise have been practical and consequently secured a much more representative and valuable collection.

The first new race to be discovered was on British territory, on the slopes of Mlanje mountain, where a new form

of the beautiful little crimson-wing (*Cryptospiza reichenowi*) was secured. Wild pig, bushbuck and speckled pigeons helped the menu while the plateaux was being explored. Thereafter the Portuguese frontier was crossed and the real work of the collector began in earnest. Vincent's plan was to halt his lorry and, using it as a base camp, to remain in one locality several days until it was obvious that he had more than a good representative collection from the district, when he would pack up and move camp fifty, sixty or a hundred miles further on, wherever changes in the topography of the country indicated that a different avifauna would be likely to occur.

Big game was in no manner an object of the expedition, but Vincent's remarks on the game of the



*Characteristic woodland in Mozambique where, as described in the text, Mr. Jack Vincent made many notable discoveries.*

country are of interest. "Very early in the tour," he wrote, "we were in the heart of the big-game country and our adventures with lions and other mammals were many and varied." He found that Portuguese East Africa at the present time is in the nature of a natural sanctuary for the fauna, for every species of big game is to be found there in great numbers.

He was struck by the amazing number of lions and the proportion of them which are man-eaters! Birds in this country were "in profusion" and daily his collections were enriched by the acquisition of species which, if not actually unknown, were at least very rare indeed in museum collections.

It is not my intention to weary the reader with a list of Latin names, but a short description of some of the new *species* discovered may possibly prove of interest. These include a honey-guide, shot on the borders of Nyasaland and Portuguese East Africa, dark olive above, and mostly white below, with the characteristic stumpy bill of the genus *Indicator*; whether or not the majority of African honey-guides do indeed lead the traveller to honey there is no definite proof, save in the well-known example of the black-throated honey guide (*I. indicator*) concerning which there is now abundant evidence. Another new bird quite unlike anything seen before is a fine bulbul (*Phyllastrephus*), brownish olive above with white throat and pale straw-yellow underparts; this bird was shot on Namuli mountain.

A little reddish-brown red-wing warbler, of the genus *Heliolais*, most nearly allied to a species found in Abyssinia, was secured at the mouth of the Lurio river, and a pretty little black-throated warbler (*Apalis*), grey and green above with a black throat and chest bordered with olive-yellow, was discovered in the forest on Namuli mountain. Finally, a bird shot in southern Nyasaland was perhaps the most



Collecting birds on Namuli mountain. It was here that Mr. Vincent found the new black-throated warbler described in the text.

interesting discovery of all: a swift, quite unlike anything that had previously been found in Africa, remarkable for the fact that it had a swallow-like indentation of the tail which was composed of long narrow and sharply pointed feathers, a peculiarity which no other swift possesses. These five are all birds which must be classified as new species, not as new geographical

species (or subspecies) of birds which are already known from some other part of Africa or elsewhere. Of these latter Mr. Vincent discovered no less than twenty-two—many of them of great interest from the point of view of distribution or rarity.

Bird-collectors, that is to say those who reach the front rank, are probably born and not made, but even though one may be "a born collector" it is not all so easy as it sounds. Mr. Vincent owes his great success to the fact that he spent a considerable time prior to leaving England studying in the Natural History Museum and making himself thoroughly familiar with what had been done in Mozambique by his predecessors. Thus he was able to devote his energies to collecting the birds which were required and avoided the common error of shooting and preserving many well-known birds which were already well represented in the National Collection. Every bird brought back is meticulously labelled with full details and the collection, of over 2,200 specimens, has given to students of African bird life a very comprehensive review of the avifauna of a part of the dark continent which had for too long remained a blank.

The interesting fact emerges from study of the species brought back that, whereas South African birds range north of the Zambesi, those found north of the hilly country more nearly approach Tanganyika forms. Once again it was proved that the high mountain peaks—the Namuli mountains rise to 9,000 feet with distinctive forests near their summits—

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harbour a fauna and flora distinct from the country around. The Namuli massif indeed proved well worth the trouble of exploring as can be gathered from the many new races which Mr. Vincent discovered in these high altitudes. A variety of country was met with—forests, mountains, treeless grasslands and savanna, and these were systematically combed and yielded a rich harvest.

A point of some interest to the aviculturist was the fact, as witnessed by Mr. Vincent, that almost every native met with belonging to the Lomwe tribe kept a yellow-fronted canary (*Serinus mozambicus*) in a small home-made wooden cage. "The birds were greatly valued, could not be purchased, and seemed to be well cared for. Even road-workers carried their birds to work with them, and when passing a large gang on the new road construction it was not unusual to see a row of cages lying along the bank at the side."

A very different expedition to that just described, but one which has added greatly to our knowledge of bird life in Africa, was undertaken by that eminent collector and traveller, Mr. George L. Bates, whose explorations in Sierra Leone and French Guinea have already been the subject of an article in *Discovery*. On this occasion the tropical forest belt, which extends from Portuguese Guinea to the Congo, almost uninterrupted save for a patch of more or less arid country on the Gold Coast—the Accra-Togo plains—was left far behind, and the country traversed was along the borders of the Sahara desert.

The object of this Expedition, undertaken privately, although collections were destined for, and have since been acquired by, the British Museum, was not only to extend our knowledge of the bird life of this little-known part of Africa, but to determine how far into the desert itself many of the birds which inhabit the thorn scrub belt lying im-

mediately south of the true desert, actually extend. With this object in view Bates landed at a port in Nigeria and without loss of time proceeded to the French Niger Colony, which lies immediately north of Sokoto—part of that vast French territory which stretches from Senegal to the Territory of Ubangi-Shari, or as it was formerly called, French Equatorial Africa. Arrived at Konni, the traveller struck due north to the wells of Tawa, Tazza and Tillia; the first named is on the very edge of the desert itself and is surrounded with sand-ridges and dunes.

The part of the French Sudan and French Niger Colony through which Bates travelled, resulting in the discovery of no less than a dozen new races of birds, lies between latitudes 15° and 17° N., and by careful observation and discriminating collecting, he was able to form an opinion as to the approximate line of demarcation between two of the great zoogeographical regions of the earth—the Palæarctic, which comprises Europe, Asia and North Africa, and the Ethiopian, embracing tropical Africa. How far south the Palæarctic really extends has been under dispute for many years, and it has generally been understood to include the whole of the Saharan desert. Not many years ago Captain Angus Buchanan, who made a sensational journey from Kano in Nigeria to Touggourt in Algeria, on behalf of Lord Rothschild, discovered a number of tropical birds living and breeding in the oases of Aïr, and this discovery induced some naturalists to place the limit of the Ethiopian region further north than it had been customary to do

hitherto. The fact that such tropical species as sun birds, colies, hornbills, barbets, golden cuckoos and glossy starlings were found isolated in a Saharan oasis pointed to the possibility of the southern Sahara having, in not very distant times, been inhabited by tropical birds, rather than by those whose affinities were European. On the other hand it was argued that

(Contd. on page 10).



The bare and rugged Island mountains in Mozambique. All the photographs are reproduced by courtesy of Mr. Vincent and of the "Ibis."

## The Princes in the Tower.

By A. F. Pollard, Litt.D.

Director of the Institute of Historical Research, University of London.

*The remains of the "Princes in the Tower" were recently exhumed from their grave in Westminster Abbey. The new evidence obtained from an examination of the bones throws new light after four and a half centuries on one of the most celebrated mysteries of history. Professor Pollard here "sums up the case."*

"TOWER, Tower, Tower, Tomb"—the refrain haunts the story of the Princes in the Tower, but its ominous significance is due to what happened to them there. When in May 1483 Richard, Duke of Gloucester, soon to become Protector and then King, intercepted his young nephew Edward V on his way from Ludlow to London for his Coronation, no alarm attached to the fact that the young King was lodged, with his Court and his Council, in the Tower; for that was the King's chief fortress where his forbears had often resided and where his successors for centuries kept their jewels and principal records. Sixty-four years later Protector Somerset took his nephew, Edward VI, from Hertford to the Tower on his accession; and the child remained there for three weeks till he moved for his coronation in Westminster Abbey.

Edward V was never crowned, and never removed from the Tower until on July 17th, 1674, some workmen, engaged on clearing the White Tower from contiguous buildings and digging under the stairs which led up to the chapel in that Tower, found about ten feet in the ground the bones of two striplings aged (it was then thought) about thirteen and eleven years. Sir Thomas More's original account (written in 1513) had stated that Edward V and his younger brother, Richard, Duke of York, had been buried "at the stayre foote, metely depe in the grounde under a great heape of stones"; and it was naturally assumed that the remains were those of the Princes in their Tower-tomb. The recent anatomical investigation makes the two children a few months younger, but nothing short of a miracle could have placed two other children's bones by themselves so aptly for the confirmation of a belief expressed by every serious historian from that day to this.

### Claims of the Pretenders.

Its truth was partially admitted by the pretenders under Henry VII. Lambert Simnel claimed to be the Earl of Warwick, nephew of Edward IV and son of the Duke of Clarence, whose attainder, said Richard III, precluded the young earl's claim to the throne; and Simnel's claim as Edward IV's nephew pre-supposed the death of Edward's sons. Perkin Warbeck did not go quite so far: he claimed to be

Richard, Duke of York, and only pre-supposed the death of his elder brother Edward V. He could hardly do less, but he did not explain how in death the brothers were divided and the younger preserved for Perkin's part. Still, somehow or other, there had been a murder, if not of Princes, at least of one Prince in the Tower. Perkin eventually abandoned his Yorkist clothing and left his tale to historical writers. The first of these to take it up was Sir George Buck, who earned a better title to fame by adumbrating a University of London under James I; he was also Master of the Revels and had a vested interest in Yorkist claims, for his ancestor, John Buck, had fought on the Yorkist side at Bosworth and was attainted in the Act of 1485 which also accused Richard III of "murder in shedding of Infants' blood."\*

### A Jacobite Champion.

The defence of Richard next become a rather unnecessary appendix to Jacobite impedimenta, and he was championed in the early eighteenth century by Thomas Carte, an otherwise respectable historian, who also got into trouble with the city of London and other authorities by demonstrating to his own satisfaction that a man had been cured of the "King's evil" by the "royal touch" of the Old Pretender. The modern vogue of the White Rose legend owes most, however, to that prince of amateurs and letter-writers, Horace Walpole. Walpole was Whig enough, but he was "the victim of spurious documents" though, as Austin Dobson says, his *Historic Doubts on Richard III* and other works "all show a literary capacity, which only required some stronger stimulus than dilettantism to produce enduring results." A century later he was followed on the same side by Sir Clements Markham who, says the *D.N.B.*, "was in all things an enthusiast rather than a scholar." Against this somewhat meagre list must be set every general English history of repute and every notable specialist on the Yorkist period—Sir Thomas More, Bacon, James Gairdner, Sir James Ramsay, Wilhelm Busch, Sir Charles Oman, C. L. Kingsford, and Professor Tait.

That is not to say that Richard III was as black as

\**Rotuli Parliamentorum* vi. 276 a.

\*Richard III of York's taxation

he has been painted nor that all the evidence used against him was good. Even in early Tudor times when Wolsey attempted to raise a benevolence in London (1525) and retorted to a city councillor, who quoted Richard III's statute, that Richard "was a usurper and a murderer of hiw owne nephewes," he was told that, although Richard "did evil, yet in his tyme wer many good actes made, not by hym onely\* but by the consent of the body of the whole realme, whiche is the parliament." No one now disputes the general excellence of Richard's legislation or even the soundness of his judicial administration where his personal enemies were not concerned. He was popular enough until rumours about the murder of the Princes in the Tower spread abroad. "He contents the people wher he goys best that ever did prince," wrote the Bishop of St. David's during Richard's summer progress in 1483. "God hath sent hym to us for the wele of us al"; and even those rumours failed to shake Richard's popularity in the North throughout his reign: the day after Bosworth Field the city of York lamented the news that "King Richard, late mercifully reigning upon us

... was pitiously slane and mured, to the grete hevynesse of this Citie." In the South the recently-discovered *Great Chronicle* of London records that "all the wyntyre seson (*i.e.*, after the failure of Buckingham's rebellion in October 1483) ye land was yn good quyete."

Nor is there sufficient evidence for the Shakespearean view of Richard as a schemer patiently plotting his way throughout life to the throne. He cannot have foreseen, still less provided for, the death of Edward IV before he was forty-one; had he lived to complete the fifty and three years, seven months, and six days" which Sir Thomas More, with meticulous inaccuracy, allots him, Edward V would have been twenty-four years old, and even the younger Prince over age;

there would have been no royal minority and no Protectorate, and without the stepping-stone of the Protectorship, Richard III could never have waded to the throne. Nor, despite the remark, reported by More as having been made on the day Edward IV died, that "now Richard would be king," is it clear that he took the offensive in the struggle between the Queen-mother's parvenu relatives and the older nobility represented by Richard III, the Duke of

Buckingham, the Howards and the Percies. The determination of the Woodvilles to rule through their royal nephew was manifested in deeds before Richard showed his hand, and there is much to be said for James Gairdner's view that Richard, like other Yorkists, was passionate, rash, and impulsive rather than cool, farseeing and prudent. He may have been goaded into seizing the Protectorship and had he been content therewith, he might have gone down to history as one of the ablest and best of England's rulers; his fate was fixed by the crimes he committed in order to seize and keep the crown.

In little more than a month he had resolved on a bid for the throne. On June 10th levies were summoned to London from the faithful York; on

the 13th Hastings, who showed signs of independence, was seized at a council meeting in the Tower and promptly executed, while Archbishop Rotherham and Bishop Morton were sent to prison. On the 16th the younger Prince was brought out of sanctuary at Westminster to join Edward V in the Tower; on Sunday the 22nd both were declared bastards by Dr. Ralph Shaa in a sermon at St. Paul's; on the 24th Buckingham in an eloquent oration to the city proposed Richard's election as King, and on the 25th the leaders of the Woodville party in Richard's hands were executed at Pontefract, while Richard himself with pretended reluctance accepted at Baynard's Castle in London a stimulated offer of the crown: his reign dates from the 26th. Still he could expect no peace for himself on the throne nor—to do him justice—for the son who was the apple of his eye and would, if he lived, succeed him. He had made bastards



Richard III from a portrait in the National Portrait Gallery.

\*Richard had in Edward IV's reign procured the exemption of Yorkshire and other northern counties from the Parliamentary taxation 1483.

and prisoners of the legitimate Princes whom he had himself recognized as Edward V and Duke of York; his own and his son's security depended upon their disappearance and they disappeared: Richard III was descended from Pedro the Cruel. The latest authentic reference to their existence is the *Great Chronicle's* remark that they were occasionally seen shooting and playing in the Tower garden some time during Sir Edmond Shaa's mayoralty which terminated on October 28th, 1483. Two references only to Edward V ("Edward the Bastard") occur in Richard III's patent rolls; neither refers to him as alive and there is none to his brother.

The rest is silence. Why, whether the Princes were still alive and in Richard III's keeping in the Tower, or still more if they had escaped? The argument from silence is proverbially weak, but not in the face of rumours breeding conspiracy and rebellion at home and public accusations abroad. In January 1484 the Chancellor of France told the Estates-General that the Princes had been murdered. Neither he nor any of Richard's subjects could compel him to plead not guilty or guilty, but Richard's silence gave consent to what was said. When Lambert Simnel claimed to be Earl of Warwick in 1487, Henry VII countered the pretension by taking the real Earl of Warwick out of the Tower and parading him through the streets of London. If, when the French Chancellor asserted that the Princes were dead, they were really alive, we may be sure that they would have been seen, once more at least, playing and shooting in the Tower garden. By that time Richard himself would have been glad to undo the murder; for, apart from any possible hauntings of conscience, the disappearance of the Princes had involved him in graver perils which soon brought his reign and his life to an end. Instead of two helpless children in the Tower, their murder had raised up against him a mature exile, as able as Richard himself, far more self-controlled and far-sighted, and free to enlist support from Richard's enemies abroad.

#### Lancastrian Failures.

The Lancastrian dynasty had been damned by failure at home and abroad; its title to the throne was based on a masculine principle of heredity which has been banned ever since in England; and Henry Tudor was not even a genuine Lancastrian. For twelve years he had been a hunted fugitive; his mother, Margaret Beaufort, had even graced with her presence Richard III's coronation, and his step-father, Lord Stanley, was high in Richard's favour. Nothing less than the murder of the two Princes could have produced

that revolution in Tudor prospects which carried Henry VII to the throne; and what but their death could have given any point to the negotiations, begun in the autumn of 1483, between their mother and Henry's for a marriage between him and their sister? Was the mother of two sons still alive planning to supplant them by means of a daughter? And if they were alive, why did not Richard produce them and thus shatter the foundations of all the plots he feared? It is this logic of history—i.e., that events have their causes and the causes precede the events—that damns Richard more fatally than such corroborative details as his own official record of rewards to Brackenbury, Tyrell, Myles Forrest, and Dighton who committed or countenanced the crime. Richard III neither denied nor attempted to disprove the fact of their death; he put the blame on no one else and he made no pretence that they had escaped. He could not produce the Princes out of the Tower in which he had placed and kept them: they were dead, and he was damned by the consequences.

### New Birds from Africa.

(Continued from page 7.)

tropical species might have reached the Air massifs from Nigeria by following the Tesallaman depression, where the sandy hills alternate with patches of pasture, vegetation and occasional trees. It was to try and settle some of these problems that Mr. Bates undertook this arduous journey, visiting in his travels many isolated posts (or wells) between Tawa and Timbuktu. His collection of over 800 specimens has greatly enriched the National Collection and his investigations have thrown considerable light on the problems he set himself to elucidate.

Bates found 116 forms of bird life north of the southern limit of the Sahara, and these he has carefully analysed. Space will not allow more than a very brief mention of the conclusions formed. There seems to be no doubt that the supply of their usual food is what influences the encroachment of tropical birds into the desert. Animal life is supported by plant life and plant life is dependent on the subterranean moisture which may be conserved for a very long time in the loose sandy soil. The presence of tropical birds which live on grasshoppers could be accounted for by the presence of those insects in the deserts, just as it was apparent that those birds which were known to live largely on termites did not extend their range beyond the edge of the desert, for termite were not found beyond its borders.

## Mosquitoes and Hydro-Electric Schemes.

*The control of mosquitoes is one of the chief problems encountered by the engineer developing hydro-electric reservoirs in tropical climates. Some of the methods employed are described in "The Scientific Monthly" by Mr. Edgar E. Foster, a civil engineer with wide experience of this work in the southern United States.*

THE connexion between malaria and electric lighting may seem obscure, but in tropical climates the connexion certainly exists, and the inhabitants living close to the source may get both from the same reservoir unless the power company has taken adequate means to suppress the mosquitoes. In creating an artificial lake as a reservoir for a hydro-electric project, it is always desirable to clear the area to be flooded of all trees and brush which may project above the water surface. In the southern parts of the United States and in other parts of the world having tropical and warm temperate climates such clearing is more than desirable; it is virtually a necessity on account of the sanitary considerations involved. It is always desirable from an æsthetic view-point to clear such reservoirs completely; and usually there is some merchantable timber which should be removed for economic reasons. In any case clearing greatly improves the reservoirs for recreational purposes, such as fishing and boating. But it is doubtful if all these reasons would justify the cost if it were not necessary for protection of health.

There are a number of serious diseases which are known to be disseminated by various species of mosquitoes. The best known is, of course, yellow fever. It is, however, the genus *Anopheles* which transmits malaria, and this genus necessitates the expenditure of much effort and money to make possible the hydro-electric projects in tropical climates without impairing the health of the inhabitants. The *Anopheles* are swamp-breeding mosquitoes preferring fresh, clean, still water in protected habitats. Suitable protection may be furnished by grass or other hydrophytic vegetation, floating twigs, chips and detritus from decaying timber. They are night flyers and during the day they are concealed in sheltered places away from light. Their maximum range of flight is usually

not over one mile, although on their first trip they may go farther; but then they are not infected and hence cannot carry malaria. All these facts are important, and on them are based various means of combatting the *Anopheles*.

The female lays her eggs in still pools of water where the eggs and larvae will find protection from their natural enemies.

The need for protection is satisfied by grass or other hydrophytic plants or by floating debris. The larvae feed largely upon minute forms of green algae which grow most abundantly in the same vegetation and debris that furnishes their protection. These



*A cleared reservoir with grassy edges which require regular dusting and oiling to destroy the mosquito larvae.*

larvae are usually found at or near the surface of the water and floating in a horizontal position; they often appear to be on the surface. The natural enemies of the *Anopheles* which are most effective in reducing the numbers of mosquitoes and hence most useful in control work are species of small top-feeding fish or minnows which prey upon the larvae. Another important fish is the Killifish (*Fundulus*). In the usual form of warfare against the mosquito, drainage of all possible ponds, pools, and swamps near human habitation is the regular procedure. This eliminates the malaria-carrying mosquito as well as all others at once by the destruction of the breeding places. In the construction of hydro-electric projects, however, that method is out of the question, for indeed the opposite course is followed in that the land is flooded instead of drained. Other means of carrying on the fight must therefore be sought and used.

In regions where malaria is prevalent proper preparation of the area of artificial lakes and ponds, such as reservoirs for hydro-electric projects, for flooding must be made as the first step, or mosquito control will be very costly or almost impossible. The

area to be prepared varies with every project and is dependent upon the topography of the land. In a mountainous or hilly country where steep slopes are the rule this preparation is relatively small for the reason that the "head," or fall, is high, while the amount of power is large and the area to be flooded is small. In other regions the slopes may be flat, and a dam with a small head will form a comparatively large lake. One project recently completed has a normal head of 34 feet and floods approximately 11,500 acres of land. In a project of this sort, the preparation of the reservoir may easily cost half as much as the dam, power plant and land and constitutes a controlling item of the total expenditure for the project.

The most satisfactory means of preparing the area of a reservoir for flooding is clearing it of all trees and brush. For all practical purposes this means clearing so that none will be visible above the water surface when it is at the lowest elevation to which it will or may be drawn for any operating purpose. On low head projects, where the water in the reservoir is shallow, this condition means clearing the entire area; on projects with higher heads, the same results are obtained by clearing completely the area on which the ground will be exposed and on the areas under the deeper water, cutting the trees and brush and tying them down by wire to the stumps, so that they will be completely and permanently submerged. This may be done at a considerable saving in cost.

The clearing of a reservoir is essentially a lumberman's job, although there are several features that are added to the task of cutting marketable timber. All small trees and brush must be cut and all material which cannot be economically transported out of the basin (and this includes a very large portion of all that is cut) must be piled and burned. Complete clearing in this manner will leave the reservoir in a very satisfactory condition for all purposes, including recreation and the later operations for control of mosquitoes. Although there will always be more or less floatage of debris from the clearing

operations when the reservoir is first filled, this soon disappears and leaves a clean lake in which there will be ample wave action and a clean shore line, both of which are detrimental to the breeding of mosquitoes.

In some cases, however, the problem of clearing is not so simple. In flat regions, where only "low head" dams are possible, a small drop in the elevation of the surface of the water will uncover a comparatively large area of ground in the upstream parts of the reservoir. While this will be beneficial as long as the edge is clean and free from vegetation, if the water remains down for any great length, the exposed land will soon be covered by weeds, brush, willows and plants fond of wet soils. When the water rises again this growth forms an ideal habitat for mosquito larvae; the wave action is broken up; there is ample food available; and there is good protection from their natural enemies, the top-feeding fish. This alternate exposure and submergence may be caused by the drawing down of the reservoir for water to operate the power plant during a dry summer or may be caused by periodic floods or by both. Of course, lands which are submerged for periods shorter than necessary for the incubation of the eggs and growth of the larvae form no part of the problem because there can be no successful breeding of mosquitoes on such land.

In such areas complete clearing is not desirable. Better results will be obtained by clearing only the underbrush and small trees, leaving the large trees to shade the ground and prevent the second growth of brush and other small vegetation. This course will permit the use of boats for chemical mosquito control when the area is submerged and allow free access to all isolated pools by men on foot when the water is drawn down.

In addition to clearing the area to be flooded, other schemes have been prescribed at different times for various projects. In one case, the builders of the reservoir were required to kill all pine trees for a distance of fifty feet from the shoreline of the reservoir. This scheme was abandoned and never put into operation. In several other



*Part of a reservoir in a cypress swamp. Brush and trees have been cut out to permit easy dusting.*

cases, were clear contours of the water for a distance of feet beyond the edge of the water. Neither scheme had the effect of keeping the water from leaving the reservoir, but the needles assumed for the season these schemes. After continuing on. Clearing greatly control, can not top-feed they were purpose. ponds the Yet there ledge in destroying this project trees and filling; minnows. For confidence is this world crude oil better on mosquito of the water mixed in the mixture spreads of film which this purpose well, yet for several For che

cases, the builders were required to clear above the contour of the highest elevation of the water surface for a horizontal distance of fifteen feet beyond the edge of the pond. Neither of these schemes have any effect on the mosquito problem, except that fallen leaves and pine needles may be assumed to float on the surface and form protection for the larvae; but since leaves do not fall until the season for mosquito breeding has practically ended, these schemes necessitate needless labour and cost.

After the area is cleared and the reservoir filled, continual work on mosquito control must be carried on. Cleared lakes with clean edges or shore-lines greatly reduce the amount of work and cost of this control, but some is always necessary. Although they can not be relied upon for complete control, the top-feeding minnows are useful as an auxiliary, and they were planted in one large reservoir for that purpose. However, they are more useful in smaller ponds than usually formed by hydro-electric projects. Yet there is one such reservoir to the writer's knowledge in which the minnows play an important part in destroying the mosquito larvae. The reservoir of this project contains considerable debris of large size, trees and logs which should have been removed before filling; it is possible that this debris protects the minnows from larger fish which prey upon them.

For complete control of mosquito breeding, dependence is placed on oil and chemicals. The oil used in this work is a petroleum product and may be a light crude oil. In one case it is claimed that kerosene is better on account of a supposed toxic effect on the mosquito larvae. The oil is sprayed over the surface of the water either alone by air pressure or by being mixed in water by pumps which throw a stream of the mixture as far as one hundred feet. The oil spreads over the surface of the reservoir in a thin film which prevents the larvae from breathing. For this purpose the oil should be light enough to spread well, yet heavy enough so that it will not evaporate for several days.

For chemical control, Paris green is dusted over the



*The undergrowth of this cyprus swamp reservoir has been cleared to permit access by boat for dusting with Paris green.*

dust, in order to effect a greater and more uniform spreading of the poison. This method is particularly advantageous over areas that are not well cleared or in shallow water where boats have difficulty in navigating, because even a long light breeze will carry the dust a long distance and it will filter down through rather heavy vegetation to reach the water beneath. The efficacy of this method is due entirely to the toxic action of the Paris green.

Both oil and Paris green are applied to the surface of the reservoir wherever larvae of the *Anopheles* may be found. The amount of material and labour required are manifestly reduced in proportion to the amount and quality of clearing done. Wherever there is a sufficient depth of water, boats are used to transport both men and material over the reservoir. For ponds and sloughs which can not be reached by boat, the men must go over the land on foot and carry their sprayer or blower and material with them.

Other methods supplementary to the above have been suggested and in some cases carried out. One of these is the purchasing by the owners of the reservoir of all land within one mile of the shore-line and moving off this land all inhabitants. This procedure attacks the malaria problem from the human side. Since the malaria parasite must pass a phase of its existence in a human being, the removal of all such carriers from the flight radius of the *Anopheles* prevents the infection of that mosquito, which cannot transmit the disease.

Although the preparation of a reservoir for mosquito control is usually reckoned as a minor part of the construction of a hydro-electric project, it is no small job in itself. It requires the skill and labour of both the civil engineer and entomologist, being, in fact, one of the few grounds on which these two meet in a common task to promote and protect health.

surface of the water and poisons the larvae of the *Anopheles* which eat it. The apparatus and methods used for this are the same as for oil, except that the pumps and sprays are replaced by blowers. Before using, the Paris green is mixed with a cheap inert material, such as lime or limerock

## The Loch Ness "Monster."

THAT elusive creature the sea-serpent is again in the news, this time in the shape of the Loch Ness "monster." Reports in the Press that an animal resembling the popular conception of a sea-serpent had been seen in Loch Ness by a number of independent observers prompted Lieut.-Commander R. T. Gould to visit the spot and to investigate the evidence. His report appeared in *The Times* and has been followed by a number of letters recalling the occurrence of similar "monsters" in various parts of the world. Commander Gould is a leading authority on the entertaining if unsatisfactory pursuit of enigmas, and is the author of *The Case for the Sea-serpent*, published in 1930. An investigation into "the case for the Loch Ness 'monster'" could not therefore have been in better hands. Commander Gould did not have the good fortune himself to observe the creature, and although he examined the evidence of many eye-witnesses with great thoroughness, the mysterious "monster" must at present be added to his collection of enigmas.

Commander Gould explains in *The Times* that when he set out for the Ness he did not anticipate that his enquiry would lead to any surprising conclusion. His theory was that the "monster" was probably a large sturgeon, a beluga, or a grey seal which, on suddenly appearing in waters where it had never been seen before, would naturally cause some surprise. But after examining the channels of access to the Loch Commander Gould was satisfied that no creature larger than a salmon could possibly enter the Loch in the wake of a ship without being observed, except in the most improbable combination of circumstances. It is possible to suppose, however, that a powerful sea-creature, drawing not more than six feet of water, might have entered the Loch unobserved through one of three weirs in a period of exceptional overflow.

### A Serpentine Head.

The Commander explains that the most striking feature of the Loch Ness "monster," and one which differentiates it from all known living creatures, is a very long and slender neck, capable of being elevated considerably above the water-level. A schoolmaster at Fort Angus, whose evidence was examined, described it as a serpentine head and neck, arched like a swan's, rising fully five feet out of the water and turning occasionally from side to side. To other observers the creature has often presented the appearance of a large dark hump, or humps, "moving through the water with considerable commotion at the rear

and occasionally also at the sides." Commander Gould rejects the theory that the "monster" is in reality a school of porpoises; the motion is quite different and no dorsal fins have been seen.

Despite the advocates of "a surviving plesiosaurus," the accounts of the creature's appearance suggest to the Commander a vastly enlarged, long-necked marine form of the common newt. At all events, his examination of the evidence leaves him in no doubt that Loch Ness contains at least one specimen of the rarest and least known of all living creatures. He makes an interesting suggestion for photographing the "monster." Excellent photographs, he says, could probably be secured next summer from a small "blimp" carrying a pilot and a photographer and directed by wireless telephony.

### "Monsters" of the Past.

Among the letters to *The Times* which have followed Commander Gould's article is one from Sir John Murray, who records that in 1815 Joanna Baillie, the eminent authoress, sent Lady Byron a portion of the bone and bristle of a sea-snake which had been caught off Orkney in 1808. She thought that this would interest Lord Byron. With her letter is a long description, stating that the snake was 55 ft. long, the thickest part of the body being equal to the girth of an Orkney pony. The head was not larger than that of a seal, and was furnished with two spiracles, or blow-holes. A description is also given of another snake, estimated to be about 80 feet long, seen at the same time, and also in the following year of a well authenticated mermaid who unfortunately was not caught!

Another correspondent records that she saw exactly the same kind of creature as the Loch Ness "monster" off the Suffolk coast in June, 1931. It seemed to be about four times the length of a rowing boat and "reared itself out of the water, flapping its fins." The claims of rival monsters in the loughs of Ireland are put forward by another reader.

Mr. W. Adamson, a former Secretary of State for Scotland, refutes the scepticism of southerners regarding the monster in the Ness. In his opinion "it is real"; while Sir Murdoch Macdonald has suggested that there has now been sufficient discussion to justify an investigation by scientists interested in deep-sea mysteries. One of the most interesting aspects of the case, as another correspondent points out, is the occurrence of the "monster" in fresh water, "a habitat not made less remarkable by the fact that its true home is in the sea." We hope Commander Gould will pursue his latest enigma with his customary avidity.

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## Correspondence.

From the Hon. Stephen Coleridge.

"WHAT ARE THE SCIENTISTS' MORAL OBLIGATIONS?"

To the Editor of DISCOVERY.

DEAR SIR,

The Bishop of Durham writes of vivisection in the November and December numbers of *Discovery* thus: "It is noteworthy that those who, like myself, defend the use of this method are at one with its opponents in holding that it must be justified on moral grounds." This is not correct; we, its opponents, do not hold that vivisection must be justified on moral grounds; we hold that it can never be justified on moral grounds. And it is as well to define what we mean by "vivisection"; we mean serious suffering inflicted on a living animal not for its individual benefit, but by way of a scientific experiment.

In another part of his articles he writes: "St. Paul's vigorous repudiation of the casuistic doctrine, thus 'Let us do evil that good may come' has not determined the practice of ecclesiastics or the theories of moralists. The practical question has rather been 'In what circumstances, and with what limits may we do evil that good may come?' Is there Jesuitry of science as well as religion?" But he does not answer his own question.

We want to hear how he justifies a dog being made to run on a lead with a bicycle with one of its organs dissected out of its body; or a dog having one of its organs dissected out, piece by piece, from its body under anaesthetics and kept alive with its wounds for weeks and months between the several dissections, and finally dying in misery in the night while the scientific professor sleeps in complete unconcern in his comfortable bed.

The Bishop quotes from Mr. Stephen Paget's well-known book "For or Against Experiments on Animals" without it dawning on the episcopal mind, first, that this absurd title leaves out the word "painful" to qualify the word experiments, so as to imply that the opponents of vivisection object to an experiment such as one to discover which of two dogs will first find a secreted bone; and secondly that this absurd title suggests that the book contains a statement of the case "against" vivisection as well as for it, whereas it is a polemical work written in defence of it by a man who devoted his later life to that object. When I wrote my own book attacking the practice I resorted to no such deceptive devices. The book bears the title "Vivisection: A Heartless Science," and to that book I recommend the attention of the Bishop.

It is difficult to deal with a writer who continually asks questions without answering them. I should like the Bishop to say plainly does he, or does he not, justify the experiments I have cited above. They took place in England under the present law. Does he justify as a moral act the infliction of serious suffering on an animal not for its own good by way of vivisection?

He speaks of Voronoff's experiments as "extremely repulsive," and as seeming to him "to open the door to further experiments which are utterly repugnant to humanity," but goes on asking his questions thus—"But is the method from the scientific point of view legitimate? and if it must be answered that it is not, then the question presses for answer, Why not? What concern has science with morality? Does not the acquisition of knowledge justify any and every experiment? . . . How far are the students of science morally entitled to ignore the quality of the results which would surely follow from their discoveries?"

And the Bishop, having asked these questions and made no reply to them, departs to another subject, viz., "the alleged discovery of a scientific method of determining the sex of

children," and again there follow more questions, but no answers or conclusions.

In another place the Bishop alludes to the possible vivisection of criminals, and again asks his questions: "Why should not his (the criminal's) punishment take a form which is serviceable to the community? Why should he not at least be given the opportunity of making in this way some atonement for his sins against society?" The Bishop as usual does not answer his own question, but I will do so for him. The Bishop says the criminal "has forfeited his rights." He has done nothing of the kind; he remains a citizen of the country, and is protected by the law. He is entitled to proper and adequate food in prison, he is entitled to be free from any ill treatment beyond the exact letter of his sentence, and can make appeal if he wishes to visiting magistrates. Indeed, in some ways his bodily welfare is more secure and ensured than that of workmen outside the prison and free.

As for the suggestion that the criminal should chaffer with the judge about his sentence, it could only come from someone quite ignorant of the whole traditions and rules of our own law and its administration; and after forty-three years' experience of Assize Courts I can assure the Bishop that I have never known a judge, out of all those on the bench since 1890, who would bring himself, even if the law allowed it, to sentence a condemned prisoner to be delivered over to the vivisectionists to be used for painful experiments in the secret recesses of their laboratories. In a civilized country, such as ours, the bare suggestion is horrible.

Throughout his article it is clear that the Bishop is treading very delicately and discreetly, and that he veils his approval of scientific painful experiments on helpless animals behind these non-committal questions to which he vouches no reply. At the very end of his discourses he at last makes one clear statement, unincumbered with interrogatories, for which we can be thankful. He says: "Science divorced from ethics carries a potency of measureless calamity for mankind"—indeed it does!

Yours faithfully,

STEPHEN COLERIDGE.

London, S.W.1.

From Fr. Dudley Ward, S.J.

To the Editor of DISCOVERY.

DEAR SIR,

Dr. Hensley Henson's article on the moral obligations of the scientist makes interesting and stimulating reading, but it is marred by a paragraph of misrepresentation. He says, for instance, that in practice Christian moralists of past ages have set themselves to answer the question, "In what circumstances . . . may we do evil that good may come?" I think he will find it impossible to substantiate this sweeping indictment. Their task was always to answer the question, "Is this a moral act?"; and they had in view the act contemplated and the circumstances, and these alone. But the morality of an act was never judged merely from its consequences.

If the scientists of the twentieth century afford to their critics as much material for satire as did the Jesuits of the seventeenth century to Blaise Pascal, these scientists have little to fear. Pascal's "Lettres Provinciales" have been shown up more than once. His facts are unreliable and his conclusions ridiculous. He was badly briefed. He tore words from their context. He did most things which would to-day be considered inexcusable.

Yours faithfully,

DUDLEY R. WARD.

Heythrop College,  
Chipping Norton.

## Contemporary Design—V.

# The Future of Western Architecture.

By Marshall Sisson.

*What is the trend of modern architecture? The day of "fashions" is already passing; and the author foresees the time when the form of expression in Western Europe will be universal and a common idiom will be used. Architects imbued with the spirit of Western culture will express a new outlook in achievements comparable with those of the past.*

AT a time when such catch-words as "traditional," "modern" and "functional," to name only a few, are freely used in relation to architecture and frequently misunderstood, an attempt to clarify the situation by removing certain misconceptions may be useful and may, by indicating the course which architecture has followed and must still pursue if it is to retain, or regain, its significance in contemporary life, establish certain critical standards whereby vitality may be recognized.

In the first place it should never be forgotten that architecture is an expression of ideas or emotions through the ordering and emphasis of the structural forms which arise from the purpose and requirements of a building. It is held by the mechanistic or "functionalist" school of thought that if a building is perfectly suited to its purpose and its construction logical, it will accordingly be good architecture. This is an incomplete view; fitness for purpose and sound construction form the necessary foundation, but at this stage a building is merely an efficient machine and can only become "architecture" when this structural basis is ordered and emphasized in such a way that it expresses an emotion. During this process, the "functional" or constructional nature of the building must, however, never be ignored or deformity will result.

### A Comparison.

By way of analogy we may compare a building with the human figure. "The human figure," to quote James Burford, "at its highest development, and carping criticisms aside, meets its purpose, and its construction is the logical outcome of the means employed. It even produces some emotional reaction in an observer, the kind of emotion we have from seeing a good thing well done. But it is stretching a point too far to claim that the human figure, without ordered movement or deliberate arrangement, is by itself a work of art. It corresponds, at this point in my analogy, to the merely 'functional' building of the mechanistic school. Now if the human figure, controlled by a skilled dancer, is put through the movements of a dance, then this meet-to-its-purpose

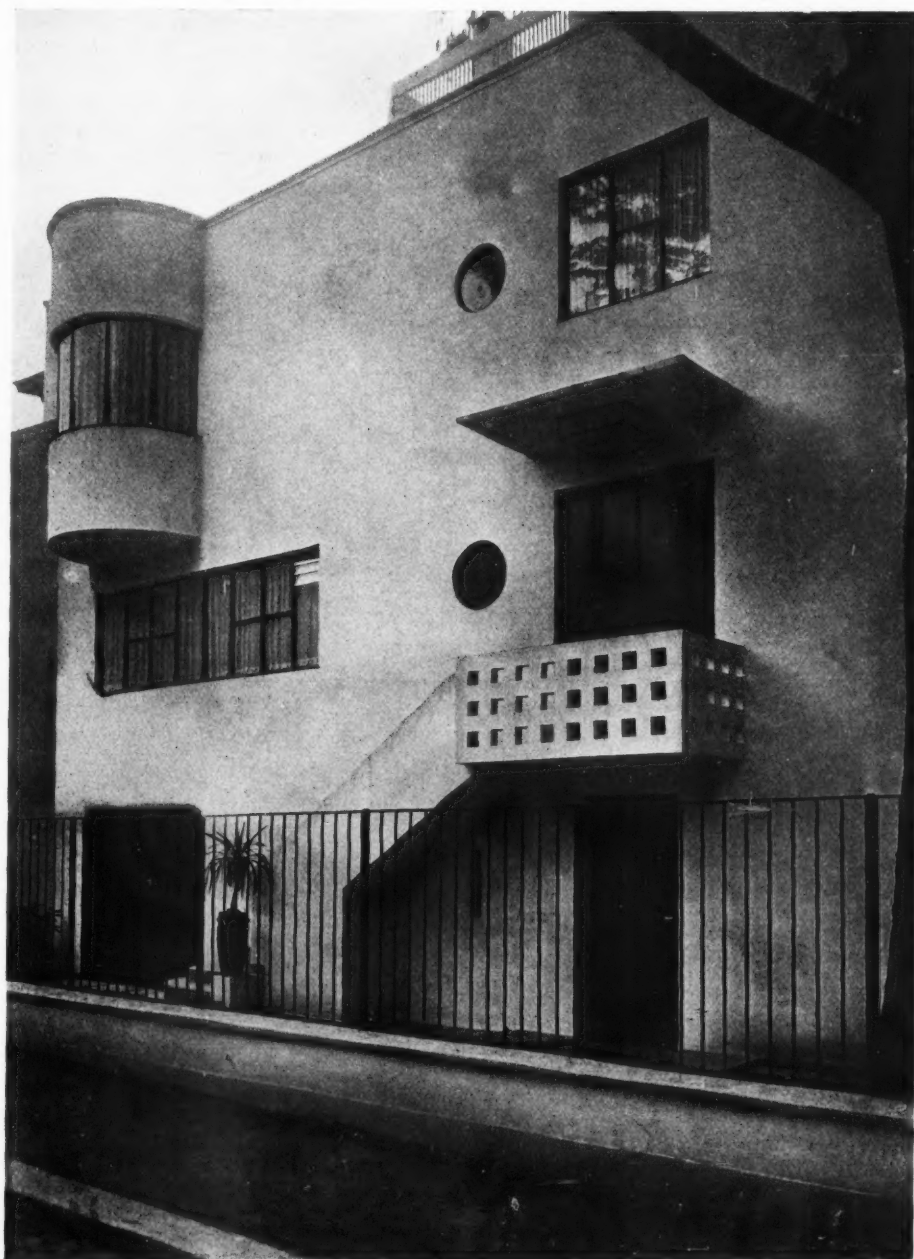
and 'functional' human body can be made to express emotion—to express emotion of any height or of any depth. Its 'functional' nature is the basis, but only the basis, the necessary preliminary provision, of this emotional expression. But there is one important limitation; the 'functional' or constructional nature of the human figure, no matter what strength or vagary of emotion it is called on to express, must never be ignored; the dance must exist, we may say, within the limit of biological fitness. Let a knee or an elbow be turned out of joint and our pleasure turns to disgust. The 'functional' aspect has been ignored, the dance becomes a disaster."

### New Materials.

Architecture is symbolism. Its history must therefore be understood in the light of the emotions and will to form of the cultural phases of which it is an expression, and not in terms of progress in technique. It is often stated that discoveries of new materials and methods of construction give rise to changes in style; this is an old fallacy and one for which historians of architecture are in a great measure responsible though history abounds in evidence to the contrary. It would be truer to say that the will to express an emotion through certain forms and appropriate symbols selects or invents the materials or constructional methods it requires for the purpose.

Style has an emotional basis: it is never dependent on the use of particular materials and constructional systems though its outward forms will inevitably be modified by them. For example, the structural differences between the stone-vaulted cathedrals and the timber buildings of the Middle Ages are conspicuous yet both forms are clearly recognized as manifestations of the same underlying spirit. Again, the Greeks were aware of the principles of arch and vault construction, but because these forms were not appropriate symbols for the ideas to be expressed, they deliberately chose either to conceal or ignore them.

If the Parthenon is compared with the Byzantine churches of Greece, or the mosques of Cairo with the temples and pyramids of the ancient Egyptians, it



*A house in Versailles, reproduced from "Architectural Design in Concrete." (Benn).*

becomes apparent that in the same locality, with the same climatic conditions and with identical materials available the different historic cultures have willed to express their ideas in fundamentally different forms.

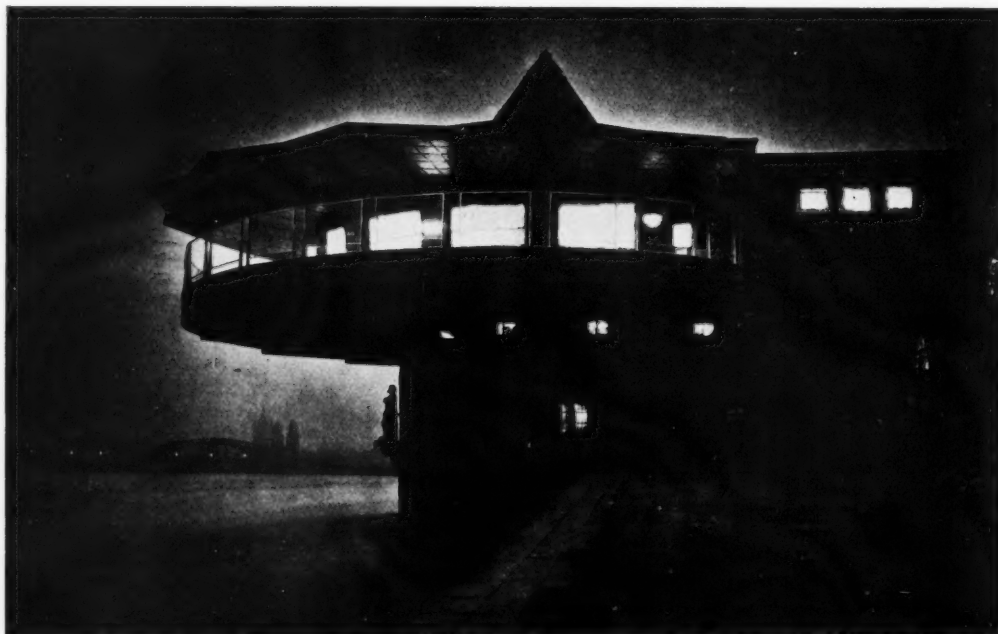
The general history of mankind as we see it now is made up of the life histories of a succession of distinct Great Cultures. Each of the Great Cultures of the past—the Egyptian, the Chinese, the Classic, the Magian, the Mexican—has passed like each individual man through youth, maturity and age and has sooner or later died and given place to another. Each has had its own characteristic view of life, its particular view of the world around, and all vital art has been a representation in symbolic form of this world-view or individual "soul" of a Culture.

Our own Culture, the Culture of the West, has now travelled far along its life course. Thus before we can properly consider the position of architecture at the present day, we must attempt to gain some conception of the essential soul or world-view characteristic of this Western Culture of which the earlier phases of Western architecture are an outward manifestation. The subject is of unusual interest but by reason of its vast range and wide implications it is only possible

here to give some indication of those aspects which bear on the immediate question of the course of architectural tradition in the West. The characteristics which distinguish our own from other Cultures can only properly be recognized by methods of comparison, but we must not forget that we are unable to enter fully into the mind of another Culture—we are Western and therefore cannot view the world with the eyes of a Chinese or an ancient Greek.

What then is the essential world-view of our Western Culture, the meaning of the world to us, expressed not only in architecture but in all the arts and animating every activity of life? We see in the West an intensely active, dynamic spirit, a will to power, constantly reaching outwards towards infinity in time and space. Gothic architecture, voyages of exploration, archaeological research, an unprecedented enthusiasm for scientific discovery and the mastery of natural forces are all manifestations of the same underlying will.

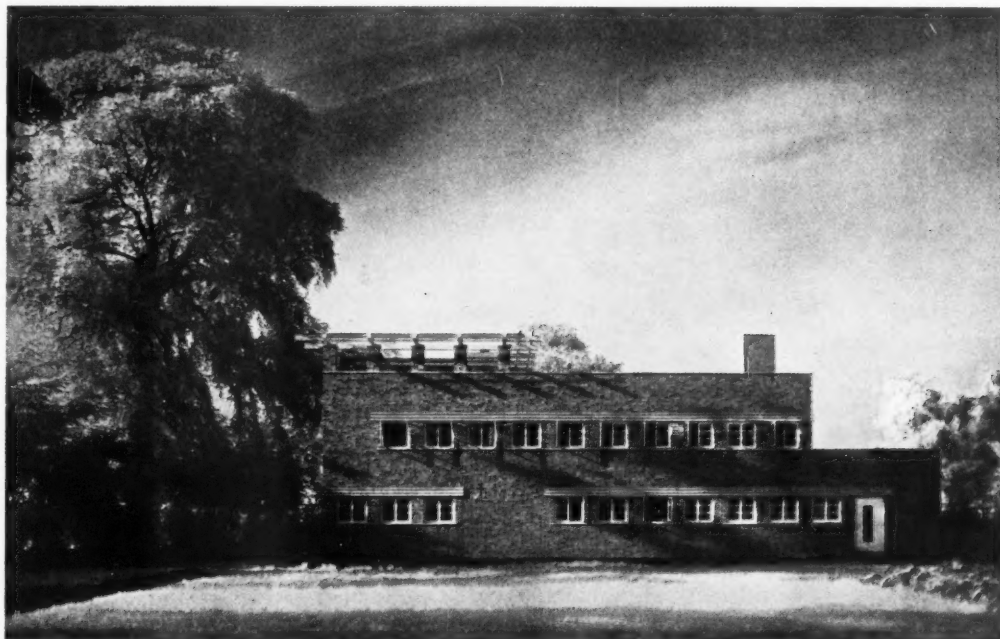
The Classic Culture of Greece and Rome, pre-occupied with the near and present, conceived a complete and limited universe, but Western man has probed further and still further into remote distances of space and time. In all Classic architecture the internal space



*A restaurant in Cologne, reproduced from "Architectural Design in Concrete." (Benn).*

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*A house at Cambridge designed by the author, reproduced from "The Architectural Review."*

seems shut in and bounded by the walls around: but from within a Gothic building the mind escapes into the unbounded through windows which, as the style matured, increased in size until at last churches became skeletons of stone enclosed with walls of iridescent glass. A Classic building such as the Parthenon is complete and perfect in itself and essentially "static"; the exact balance between weight and support is expressed by the simple form of column and lintel. The Gothic cathedral, on the other hand, with its constructional system of arch and counter-thrust is "dynamic" and expresses constant stress and activity; while the weights necessarily press downwards to the earth through piers and buttresses, the whole mass in appearance surges upwards. A state of constant interaction of opposing forces is characteristic of this dynamic Culture of the West. The Classic ideal might be characterized as perfect "attitude" and the Western as "action."

Western art depends largely on the significant relation of its component parts. Hence in a Gothic cathedral all parts of the structure are organically related and the sculpture is an integral part of the building. Every Classic statue and even each

sculptured figure of a Greek frieze or pediment seems to be complete in itself and to owe little to its relation with others, but a Gothic figure removed from its setting is almost meaningless. Classic architecture may be regarded in the light of an arithmetic expression of number and magnitude while the architecture of the West, in its dynamic interplay of forces, might perhaps be considered as analogous to the relative values of an algebraic formula.

The two great architectural expression-forms of Western Culture are the Gothic of the Middle Ages and the Baroque of the sixteenth, seventeenth and eighteenth centuries. The Baroque has often been represented as a debased form of Classic architecture: it should, however, be regarded as a stylistic expression in which certain forms borrowed from Roman Classic architecture were transformed and used in a purely abstract and plastic manner to give expression to the Western soul. As Worringer, the most penetrating critic of Gothic form, has stated, "In spite of non-Gothic means of expression, the Gothic character is still quite plainly visible in Baroque." Baroque architecture is the counterpart of the great contemporary musical expression; it is "aesthetic"

while the Gothic is "architectonic," but both are expressions of the dynamic world-view of the West. The "architectonic" building expresses in its design the actuality of structure, the "aesthetic" building, the emotions relating to structure.

Having formed some slight conception of the spirit underlying our Western architectural expression in the past, we are in a better position to judge between what is vital or traditional in the true sense and what is irrelevant in the architecture of to-day. The nineteenth century was an age of rapid technical development and unco-ordinated individualism in economic life when old forms were lost and social traditions broken. Early in that century the continuous tradition of Western architecture was obscured owing to the exhaustion of its current "form language," the onset of materialism and the flood of technical invention which we are only now beginning to master. A period of personal choice and eclecticism founded on scholarship followed when numerous attempts were made to utilize in design the architectural forms pertaining to earlier phases of our own and other cultures.

At the present time many architects, in the name of "Tradition," advocate this scholarly adaptation of historic forms—expressive in their day—to contemporary buildings; but the result has never any real significance, and more often than not involves the distortion of the functional character of the building to suit the requirements of the historic form. A vital architecture cannot be founded on scholarship, and adherence to the outward forms of the past does not constitute tradition; this lies in the continued manifestation of the same underlying will through an expression in contemporary terms. Buildings of the past should be regarded as standards of achievement, valuable for purposes of comparison, rather than as models for imitation.

#### Adapting Past Styles.

Advocacy of this adaptation of past styles, recognized as admirable in their time and place, generally implies that its exponents are no longer able to maintain their bearings on the main stream of tradition but are becalmed in the backwaters of eclecticism. Architects who are in the true path of tradition seek to express fundamental ideas in terms appropriate to the present. This does not imply revolution. A movement without roots in the past can have no vitality or cultural significance; its strength must lie in the development of that emotional outlook which in the past gave rise to the great architectural achievements of the Gothic and the Baroque. Modern experiments in unfamiliar

architectural forms are often represented to be the evidence of a craving for novelty for its own sake regardless of suitability. In certain cases superficial characteristics of the contemporary movement may have been exploited as a fashion to gain notoriety, but such temporary expedients will not deceive those who have a true understanding of the tradition of the West.

#### "Vital Architecture."

Vital architecture of the present day, ordering extremely complex conditions and employing a highly developed constructional technique, is an outward manifestation, in its apparent simplicity and economy of means, of a desire to master and to use those same forces which in earlier phases of our Culture were symbolically expressed in the dynamic energy of the Gothic and the voluptuous exuberance of the Baroque. This will to reduce complex forces to order finds a parallel expression in the growing desire for a more ordered and organic system of planning in national life.

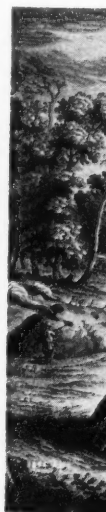
In the best contemporary architecture all parts of a building are closely inter-related, forming a highly systematized, organic whole. This architecture resembles the Gothic in its "architectonic" quality, but though highly technical means are employed the basis is emotional and not mechanistic. In the present phase of our Culture the view of life is becoming more realistic or factual and this outlook finds its expression in the marked horizontal emphasis characteristic of contemporary buildings.

With the growing determination to order and use the emotional forces underlying our Western Culture, which is apparent in the widespread modern movement in architecture, the day of fashions and eclecticism is passing and a state, in this respect not unlike that existing in Western Europe in the Middle Ages, will be reached when the form of expression will be universal and architects will use a common idiom. As in Gothic architecture, differences of national temperament will influence style, but the expression will be, in its emotional basis, that of Western Europe (and now also America) and a contemporary manifestation of our Western Culture.

Such then is the course ordained for Western Architecture and the alternative to advance is disaster. Much still remains to be done and architects imbued with the vital spirit of the Culture, but freed from the tyranny of outworn phrases, may yet express this spirit through achievements comparable with those of the past in forms appropriate here and now.

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## A Revival in Charcoal Burning?

OVER 4,000 tons of wood charcoal are imported every year into the United Kingdom. If this tonnage of charcoal were produced by burning in this country, more than 20,000 tons of cordwood would be utilized, with consequent advantage to the owners of oak, beech, ash and birch trees, who at present have no sale for their toppings and small woods. If this tonnage of cordwood were carbonized in retorts by means of coal, at least 2,000 tons of that fuel would be required. In view of these figures, our contemporary *The Chemical Age* publishes an interesting review of the charcoal-burning industry in Great Britain.

The demand for charcoal came from the need of a fuel suitable for smelting ores. Charcoal was once in common use as domestic fuel as it is to-day in France, India, China and other parts of the world. The earliest method of charcoal making (by the Macedonians) was in open pits, but this was replaced at a later stage by the more efficient "heap" system. Engravings of 1766 illustrate the method employed. The wood was collected into heaps and covered with earth and sods, except for vent holes round the bottom. The contents were then ignited, and when the heap of wood was aglow, the vent holes were closed except on the wind side. The rapidity of carbonization was thus controlled so as to last five to ten days according to the size of the heap. The mass was then allowed to cool and finally extinguished with water. Charcoal produced in this way was dirty, full of stones, earth and unburnt pieces, and also wet. In addition, all

the products from the wood were lost in the air.

The next stage in the evolution of charcoal burning was the brick and the metal retort into which about 10 cwt. of the wood was placed. The retort was heated with wood or coal by means of brickwork flues; clean dry charcoal was thus obtained. As outlet pipes were

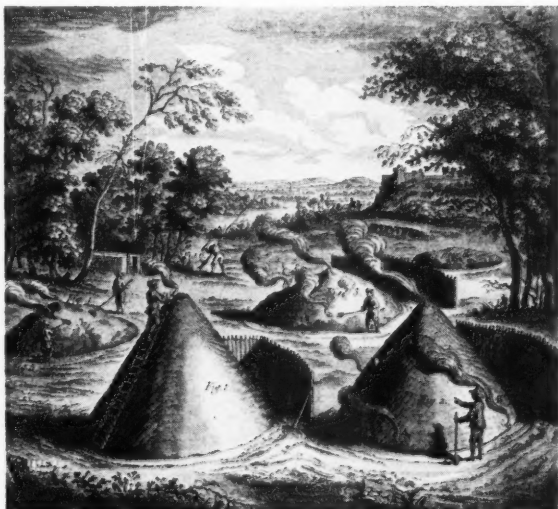


*Charcoal making 168 years ago.*

fixed to the retorts, the vapour from the wood could be recovered by means of condensers. Boyle, in his *Sceptical Chemist* (1661) described the separation of a spirituous liquor from the volatile products obtained by the destructive distillation of wood. This was undoubtedly the wood spirit as we know it to-day.

In 1796, a factory was erected near Rotherham in Yorkshire to supply retort-made charcoal to the Sheffield metallurgical industries. As it had also been discovered that some of the salts of acetic acid were valuable mordants in the Lancashire cotton trade, a further impetus was given to the investigation of wood distillation products. Until the beginning of the century, the main products obtained by destructive distillation were charcoal, acetate of lime, wood naphtha and wood tar. Economic conditions, however, soon brought about improvement in technique.

The modern method consists of a 24-hour cycle of operation. The wood is charged into carriages which are mechanically hauled into the retorts. The retorts are of steel, set in brickwork, heated either by coal fire or producer gas. The operation of charging and discharging the retorts occupies but a few moments so that little temperature loss takes place. The temperatures are recorded by electrical pyrometers. At the end of the twenty-four hours, the carriages are withdrawn into steel cylinders where, with the exclusion of air, the charcoal cools. The distillate from the retorts is also refined within the same period, with the



*Methods of charcoal burning in the woods, 1765.*

production of grey acetate of lime, methyl acetone, miscible wood naphtha, wood creosote, wood tar and pitch. These articles form the raw materials for the production of other chemicals required by industry, such as acetic acid, acetone, formaldehyde and medicinal creosote, and they were the only source of supply.

When we consider that the carbonization of one ton of wood only produces approximately 100 lb. of 80 per cent. acetic acid, 3 gallons of acetone and  $2\frac{1}{2}$  gallons of wood naphtha, we can understand that as soon as industry required larger supplies of these commodities for cellulose and rayon manufacture, some method of production other than wood distillation was essential.

Progress, however, has also been made in the technique of wood distillation. Retorts holding 10 tons are now in common practice, with the working up of the hitherto waste products (such as oils and tars) into saleable products. So far, no satisfactory material has been produced as a substitute for charcoal. Among the present day commercial uses for this article are case-hardening, chemicals, cattle and

poultry foods, medicinal, insulation, filtration, horticulture (bulb-growing and greenkeeping) and as a fuel for internal combustion engine. The latter item is of considerable potential importance at the present time. By means of a small gas plant fixed on to the running board of a lorry, it is possible to propel a 30-cwt. load for 100 miles at a total fuel consumption of 72 lb. of charcoal. There are, of course, certain inconveniences attached to the use of charcoal as a fuel, but they are not serious.

The fluctuations in the industry of charcoal burning provide interesting contrasts. In the beginning the prime product was charcoal. The next was the recovery of the condensable gases in addition. To-day, it would seem that a return to the original mode of manufacture may be a natural sequence, with the erection of portable retorts in the woods and saw yards to provide fuel for internal combustion engines. Without such an outlet for charcoal, it would certainly seem that no expansion of the industry can take place; but whether it can maintain even its present status is problematical.

## Book Reviews.

*First Russia, Then Tibet.* By ROBERT BYRON. (Macmillan 15s.).

The many books on Russia published during the past few years are almost entirely devoted to the Five Year Plan, or at least to Bolshevism, but here at last is one by a man who, though new to the country and apparently not knowing the language, can see something else in Russia than Communism. He looked upon "golden-headed Moscow" not with the eyes of a politician or economist, but of an artist, and of an artist with a penetrating eye. The key to everything Russian, he maintains, is mass. Through mass their politics, their commerce and their architecture become comprehensible. Mr. Byron writes of Russian art as the child of Byzantium, conceived in the land of precision and individualism, matured in the realm of vague outlines and of mass. Few Englishmen know anything of Russian art. Of her painting not many know that it exists. The author pays tribute to "those accomplished realists, Vereshchagin and Repin," but does not like Vrubel, "a nauseating throwback, whose very name is an impiety." The most remarkable artist that Russia has produced, he tells us, is the monk Rublev, who worked in the early part of the fifteenth century. He has left a single memorial, a panel of three angels, but of enormous significance. It marks the coming-of-age of Russian art, its final and complete weaning from its Byzantine parent, the establishment of a new tradition and a new criterion.

The author does well to remind us that the history of Russia is continuous. It is the reverse of ours, for her history began in commerce and grew into feudalism. Yet the main essentials of Russia are the same to-day as in the days of Ivan and Peter. The only difference between the Red troops whom Mr. Byron describes so vividly and these of the tsars is that the former wear

the "pointed Tartar crowns" on the helmets, which the wags call the *umotvod*, the "wit-conductor." Really it is a reminder that Russia to-day is more than ever an Asiatic power. The illustrations are fine, but we do not like the transliteration of Russian names. The second half of the book might have been written by another author. Three chapters of preliminaries bring us to the frontier of Tibet, where he was admitted on undertaking to obey certain conditions, among others, neither to fish nor shoot, in deference to the dictates of Buddhism, and not to publish anything that might hurt Tibetan susceptibilities, for it appears that the Dalai Lama had been offended by some indiscretion of one of the Everest expeditions.

At first the author found the land "gripped by an unholy hierarchy and possessing no amenities of life beyond devil dances and butter statues." But as he penetrated further he must have learnt that the miscalled devil dances are ceremonies with deep symbolic significance. The artist found compensation in the extraordinary light effects, "such that colours assumed a relation, ship and tonality outside the normal ken," and he was struck by the "burning turquoise skies and pop-eyed clouds." As he grew to know the country better he began to notice the smiles of the people—he admits that he could not understand their music—and eventually he learnt to love the mediaeval way of life. Still he reflects, justice is cruel, disease rampant, independent thought impossible, so perhaps after all we might have something to give them. He respected Mary, as he called the sophisticated Tibetan wife of a Sikkimese prince. She said: "I love Tibet. If only it had trains or motors I think it would be the nicest country in the world." As the author remarks, once those things were introduced, it would no longer be the Tibet the woman loves.

This book has the advantage over most books on travel in Tibet. It treats the natives not as animals nor museum

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specimens, but as human beings. As the author grew to know them better and even picked up a little of their tongue, he realized that they have great joy in life, and that their dour land is after all not without its amenities.

*The Portuguese Pioneers.* By EDGAR PRESTAGE. (Black. 15s.).

The Pioneer Histories, edited by Dr. J. A. Williamson and Mr. V. T. Harlow, have already received a deservedly wide welcome, and Professor Prestage has made an admirable addition to the series. The books provide broad surveys of all the great migrations of European peoples into non-European continents for purposes of trade, conquest and settlement. The editors have rightly borne in mind the fact that in order to grasp the full significance of present-day international affairs the reader must look to the past for the foundations of the present, and abandoning a local for a universal perspective, must take for his study the history of a world invaded by European ideas. And it is rightly said that, if the study has its interest for the student of affairs, it has also its appeal for those who dwell most on individual character and ingenuity.

Professor Prestage shows how the geographical position of Portugal invited her to become a maritime power, and how, in spite of a population of only one and a quarter millions, she succeeded in discovering half the world in less than half a century. Even the Portuguese themselves, however, have produced no adequate history since the sixteenth century of this remarkable achievement. During the last sixty-five years much material has been collected and printed in Portugal, but little has been made available for English readers; much of it has been used in the present book. All the recorded voyages of discovery down to the fifteenth century are described, and from then until the middle of the sixteenth century only the more important are included. Here the narrative ends. Professor Prestage has written widely both in English and in Portuguese, and his book is the result of his own researches into the Portuguese expeditions. He writes in an attractive way of the voyages which resulted in the discovery of Madeira, the Azores and the Cape Verde Islands; of the expeditions to the coasts of Africa and Brazil; and of the sea passages to India, Malaya, the Spice Islands, China and Japan. His pioneers include such romantic figures as Prince Henry the Navigator, Diogo Cao, Cadamosto, Bartholomew Dias and Vasco da Gama. There is a map of the world showing the places discovered and visited by the Portuguese, a map of the west coast of Africa illustrating the voyages of Henry's seamen, a map of the voyages of Cao and Dias and one of Vasco da Gama's and Pedro Alvarez Cabral's expeditions.

*The Crystalline State.* By SIR WILLIAM BRAGG and W. L. BRAGG. Vol. I. A General Survey by W. L. BRAGG. (Bell. 26s.).

The use of X-rays in studying the micro-structure of matter has rapidly developed in recent years. This admirable book gives a broad general survey of the subject which shows its possibilities in many directions. There are, of course, several excellent books already in circulation, but none are in English, and much of the information contained in this book is only to be found scattered among many journals. This volume, which is the first, forms an introduction to the whole work, to be completed in two further volumes. Every branch of X-ray analysis is briefly described, and the authors have aimed at making the

subject intelligible to anyone interested in the main principles. Added value is given to the book in that the authors have had the collaboration of many experts, each an authority on one aspect of the subject. Chapter I deals with the crystalline state, and such subjects as the crystal pattern, lattice planes and crystal faces, and external and internal structure are described. In succeeding chapters the authors go on to consider experimental methods and examples of crystal analysis, X-ray optics and the application of X-ray methods to problems of pure and applied science.

In assessing the value of X-ray methods in industry, the authors point out that it is possible only in exceptional cases to record a direct connexion between an investigation and a consequent improvement in technique. The main function of the work must be to provide accurate information about the materials which are being utilized and so indirectly to aid the technical expert who can put his knowledge to practical use. A works laboratory has its chemical analysts and metallurgists who examine the materials in order to arrive at a better understanding of their nature and properties, the causes of their breakdown and the reasons for their usefulness. The general value of such knowledge is unquestioned, and X-ray methods take their place along with the older methods as a means of obtaining it.

Parts of the book are necessarily specialized, but to the student who does not require a full treatment it will be invaluable, and many of the chapters will be of interest to almost every class of reader. There are many excellent illustrations.

*Sir Anthony Sherley and His Persian Adventure.* Edited by SIR DENISON ROSS. (Routledge. 12s. 6d.).

The latest addition to the excellent Broadway Travellers series will afford great satisfaction to those who like the vigorous personalities of the spacious days of England, but still more to those interested in life and conditions of Turkey, Persia, and Russia in the time of Queen Elizabeth. Sir Anthony Sherley was a sturdy, enterprising and not over-scrupulous son of a Sussex knight. With a party of companions, three of whom have left detailed accounts of their odyssey, he made his way to Persia. In the Levant they found a busy colony of English merchants. Zante, for instance, was so well known to the English that one of the authors, Parry, explains that he did not trouble to describe the island. At Aleppo they were well entertained by the English Consuls and feasted for six weeks in English houses. The glory has indeed departed.

They found the Greeks proverbially merry, but none of them liked the Turks, and they were relieved to arrive in Persia where the Shah, Abbas, had restored the glories and power of the country and established law and order under iron discipline. He received the travellers royally. He is described as then about thirty years of age, small in stature but handsome, and with a strong and active mind and an extremely agile body. He was given to cutting men in half when they proved difficult and if the Englishmen were somewhat shocked at his summary method of discipline, they were obliged to admit its success. The Persian Court was devoted to gallant sport and exercises. Mainwaring describes how the Shah with his nobles divided themselves into two parties of six horsemen each, "having in their hands long rods of wood about the bignesse of a man's finger, and on the end of the rods a piece of wood nailed on like unto a hammer. They had a wooden ball and goals at each end, and played, striking the ball from one to another, in the fashion of our football play here in England." This description of the ancient

and royal game of polo in its original home must have been written about 1598.

The Shah took Sherley into his service as ambassador to Europe, trusting through him to enlist a counter-balance in the west against the power of his rival, the Grand Turk, but Sherley does not appear to have taken his duties conscientiously, for he changed masters several times before his end. The party returned to Europe via the Caspian, where they were impressed by the perpetual fires of Baku, and thence to Moscow, but they are disappointingly vague about conditions in Russia. They were treated with suspicion and experienced much discomfort until a trifling incident brought about an improvement. Sherley had a thorn in the flesh of his party in the form of a lewd and gamesome friar who had attached himself to them. When the friar had so provoked Sir Anthony "that his blood boiled with the excess of his choler's heat, he gave the friar such a box on the ear that the fellow fell down as though struck by a thunderbolt." This seems to have appealed to the emperor, for from that moment he treated Sherley and his companions with honour and feasting. Still, they were detained in Moscow for another six months, "expecting every day some mischief to be done." After their return to Europe, Sherley seems to have neglected his duties to the Shah and set about collecting other missions for various European potentates.

*Napoleon III., the Modern Emperor.* By ROBERT SENCOURT. (Benn. 21s.).

There is opportunity for the writing of original works on nineteenth century history, for new material is being placed at the disposal of scholars from public archives and from private collections. Mr. Sencourt has essayed to write the life of an enigmatic figure, and he has been able to make use not merely of the Vienna, Paris and London archives, but of unpublished papers of Lord Cowley, Ambassador at Paris, of the Duc de Morny, half-brother of Napoleon III., of Lady Burghclere, and other private sources. The result is a book which certainly amplifies the existing knowledge about Napoleon III. and makes his outlines much clearer.

Napoleon III. puzzled people in his lifetime, partly because he was an unusually strange mixture of good and bad, and partly because he was so phlegmatic, silent and sphinx-like. His adventurous early career, his dreams, his disappointments, his astonishing successes in middle age, and the final catastrophes of himself, his family and his country, are a great romance which has always fascinated historians. Mr. Sencourt's picture supplies not only clear outlines; it is filled in with substantial and convincing details. He describes Louis Napoleon's early years on the Lake of Constance; his education, his military service in Switzerland, his reckless adventure on the side of the Romagna rebels in 1831. Apparently he was not actually a member of the Carbonari, though his elder brother, who took part with him in the Romagna rebellion and died in that year, was a Carbonaro. Archbishop Mastai-Ferretti, later Pope Pius IX., saved Louis Napoleon's life, or at any rate saved him from arrest as a rebel, by having him driven out of Spoleto, which the Austrians were approaching, in his own carriage. After the fiasco of the attempt to raise the standard of the Empire at Boulogne and after the imprisonment at Ham, Louis Napoleon lived in London, where he was impetuous, fashionable, and dissipated. He proposed to Miss Dawson-Damer, later Countess Fortescue, and was rejected. Mr. Sencourt has this fact from "private information."

The election of Louis Napoleon to the Presidency of the Second French Republic opened the way to the disgraceful *coup d'état*

which was a step to the Imperial throne in the following year, 1852. The Emperor chose for his wife the youthful Comtesse de Montijo, who had already refused the Duc de Doudeauville. This, too, is from "private information."

It must not be thought, however, that Mr. Sencourt's new material deals only with the matrimonial affairs of the Emperor. His information leads him to challenge the usual view concerning Napoleon's attitude towards the Crimean War; the Emperor seems to have done his best to prevent it. The Italian policy of Napoleon III. is well described, though less new material is available for this than on other subjects. In Mr. Sencourt's account of the origins of the war of 1870 the balance is carefully drawn, not only between the responsibility of the Emperor and Bismarck, but of the Empress Eugénie, Ollivier and the Duc de Gramont. The society—a little shoddy, as it is generally believed to have been—of the Second Empire is admirably described.

*Travels in Arabia Deserta.* By CHARLES M. DOUGHTY. With an Introduction by T. E. LAWRENCE. (Cape. 18s.).

Everyone will be grateful for this edition in one volume of Doughty's monumental work, with the added attraction of an introduction by Colonel Lawrence, who describes the book as the "bible" of the traveller in Arabia. Doughty's book is probably unique in English literature; it is a masterpiece of prose, and as Colonel Lawrence says, the more you live in Arabia, the more you find in *Arabia Deserta*; the more you travel there, the greater your respect for the insight, judgment and artistry of the author. The book has no date and can never grow old. It is the first and indispensable work on the Arabs of the Desert. Doughty himself in a preface modestly likens the book to a mirror "wherein is set forth faithfully some parcel of the soil of Arabia."

Colonel Lawrence spent nine months in Western Arabia, much of it in the districts through which Doughty had passed, and he found that Doughty had become a history in the Desert. It was more than forty years later, and that space of time even in England would cause much to be forgotten. In the Desert it is relatively longer, for the hardships of common life leave little time for the body to recruit itself, and so men are shortlived and the memories of strangers soon fail. But Colonel Lawrence says they have made something of a legend of the tall and impressive man, very wise and gentle, who came to them like a herald of the outside world. His aloofness from the common vexations of their humanity coloured their imaginations. He was very patient, to be accepted into their confidence without doubt.

This edition of *Arabia Deserta* is complete and unabridged with all the original maps, plans and illustrations, printed on thin paper and bound in one volume. It may never be replaced as the text-book for the traveller in Arabia, and it will live as a delight to the general reader. The price places it within the reach of all.

*Riddles of the Gobi Desert.* By SVEN HEDIN. Translated from the Swedish by ELIZABETH SPRIGGE and CLAUDE NAPIER. (Routledge. 18s.).

Dr. Sven Hedin, the veteran Swedish explorer of Central Asia, continues the story, begun in *Across the Gobi Desert*, of the large Swedish scientific expedition which has been for some years working under his direction in Southern Mongolia and Eastern Turkestan (Sinkiang). As much of the volume consists of reports by members of the expedition on special subjects—notably Bergman on Stone Age remains and Haude on the

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meteorology of the Gobi desert—it is not easy reading, but a great deal of good work is evidently being done. The chapters dealing with travel and political conditions in this enormous and inhospitable region, which is some 3,000 miles in length from east to west and 1,200 miles across from north to south, are of more general interest. Dr. Hedin was much hampered in his work by the suspicions of the Chinese authorities in Sinkiang, after the murder of his friend Marshal Yang in July, 1928; the gas cylinders which he took to inflate his observation balloons excited special uneasiness, as they were thought to be cannon. Since the date at which his narrative ends there has been civil war in Sinkiang, so that Dr. Hedin's labours are presumably interrupted. But there is plenty of work to be done in the Gobi desert, as Mr. Roy Chapman Andrews has shown in the recent reports of the American expedition, and many new discoveries may be expected, especially in regard to primitive man, and the animals that he had to face. Dr. Hedin prefixes an interesting sketch of the history of travel in Southern Mongolia from the early Christian centuries when the Chinese regularly used the "silk route" for trade with Europe. The Moslems first and then the Mongols threw Central Asia into confusion, and the sea route replaced the land route for trade between East and West. The book is well illustrated and has a good map.

*Richard Jefferies.* By REGINALD ARKELL. (Rich & Cowan. 7s. 6d.).

Mr. Arkell starts with a great advantage in writing about Jefferies, for he was born and bred in the same countryside. He tells how, after a chance encounter with *Meadow Thoughts*, he borrowed his brother's bicycle and, taking the London Road, found the milestone marked "To London, 79 miles," and the house where Jefferies was born, all exactly as described in the essay he had been reading. This was a good beginning, and we are not surprised to find that the author's sympathy with and understanding of his subject are large and wide. He knows the west countryman's intense love of his native earth, and how, once aboard one of "the trains that run from Paddington," he feels that he is homeward-bound.

To most who love Jefferies *The Story of My Heart* is his greatest work, though it will always arouse criticism. It is amazing in these days to find that anything so spiritual should ever have been dubbed "pernicious." Hudson wrote that the book touched the borders of insanity. Genius often does, but it was a divine insanity which Hudson himself shared, for there was a strain of mysticism in him, though his approach to nature differed from that of Jefferies. To quote Mr. Arkell, "any creative artist has experienced similar emotions, though few of them have described them in such haunting and imaginative prose." There is much in nature which is uncommunicable in words. Only those whose hearts are attuned to her subtler influences can understand. As Edward Thomas truly wrote, "nature, as Jefferies thought of it, and as his books present it, is a great flood of physical and spiritual sanity, 'of pure ablution round earth's human shores,' to which he bids us resort."

The book is discursive, but it is none the less pleasant for that. We do not agree with Mr. Arkell that "nature-study, as Richard Jefferies practised it, is dead." With the pseudo-nature-lover it never lived; but there are others in whose hearts the flame burns; many of them are inarticulate: a few can communicate a part of what they know and feel. Edward Thomas was one of them. Mr. Arkell says that very probably Jefferies died without guessing

that he had achieved fame, and that he would be surprised if he could see the memorial tablet at Coate and his bust in Salisbury Cathedral. We agree. And, further, we doubt if he thought or cared much about fame. Like most nature writers he had to do hack-work, but the things which were nearest his heart he *had* to write, and once written he probably troubled little as to what others thought of them. He was before his time: to-day he has a larger public than while he lived.

*The Progress of Man.* By A. M. HOCART. (Methuen. 7s. 6d.).

In this little book Mr. Hocart has attempted the by no means simple task of providing a framework for the multifarious data of anthropological science. As he points out there is no general agreement among anthropologists on fundamentals. The many special studies into which the science is divided have each their own specific problem or group of problems to consider and their individual methods of study. The results of the various branches of research are only rarely brought into relation with one another within the bounds of a synthetic survey; and specialist workers pursue their special investigations without reference to the aim of the science as a whole.

There are signs that some, at least, among the anthropologists are alive to the dangers of sterility which may supervene on over-specialization. Mr. Hocart's book is a welcome signpost pointing in the right direction. For him the point of synthesis is the study of the character and evolution of man as a rational being; and the contribution to this end of the various branches of anthropological enquiry are each surveyed here in turn. Those who hold the larger view will welcome Mr. Hocart's insistence on the unity of past and present, ignoring the line of demarcation usually drawn between archaeology and ethnology, and his constant references to the applicability of anthropological principles to the affairs of members of a modern civilized community equally with those of savages. Mr. Hocart's intimate acquaintance with the savage in his native lair endows his writing with a vigour, a sense of reality and a humour which make his book a delight to read.

*Diptera of Patagonia and South Chile.* Part IV: Empididae. By J. E. COLLIN. (British Museum: Natural History).

The *Empididae* are a family of flies abundant in individual and numerous in species with remarkably interesting habits. In the genus *Hilara*, for instance, Hamm has shown that the male buys the favour of his mate by the offer of a gift, usually a dinner in the form of some smaller fly. Eltringham has described and illustrated in detail the silk-spinning apparatus in the tarsi which enables them to hold their prisoner captive. There are some three hundred species known in this country, but there is no satisfactory monograph, and the student who wishes to identify his specimen is obliged to study a scattered literature in several languages.

It is a remarkable fact that in this respect so remote a country as Patagonia is better known than our own islands. The specialized collecting in a short time by Dr. Edwards has brought back a collection which has enabled Mr. Collin to write a monograph of the Empid flies of Patagonia and Southern Chile covering no less than 247 species, of which 198 are new to science. It is an elaborate monograph running to 334 pages, with 74 figures in the text and dichotomic tables, sub-families, genera and species. Mr. Collin points out that there are many large genera feebly differentiated from each other, each containing

an enormous number of species. He explains this by suggesting that there has been a great outburst of evolutionary activity in comparatively recent times.

The Empids, which are of arboral, terrestrial and semi-aquatic habits, have generally been regarded as a boreal group, but it now appears certain that a vast number of species has yet to be discovered in humid mountainous regions in any part of the world. Mr. Collin suggests that even this collection obtained by Dr. Edwards probably represents only a fraction of the total number of species inhabiting the region investigated. While our knowledge of the distribution of the group is still only fragmentary, certain interesting conclusions seem to stand out. One is that certain almost world-wide genera are not represented in this southern point of South America, nor are they known from New Zealand. Also, of the genera recorded merely from North and South America, only three reach Patagonia, but they are unknown in New Zealand. There are no conspicuous gaps in the Patagonian fauna, all known sub-families being represented. Typical members of the *Hybotinae*, however, appear to be absent, as they are from New Zealand, although they are numerous in the more northerly parts of South America.

The Empid fauna of Patagonia and southern Chile has marked peculiarities of its own. It is very distinct from that of the rest of South and of North America, and it more closely resembles that of Southern Australia and New Zealand.

*Applied Geophysics in the Search for Minerals.* By A. S. EVE and D. A. KEYS. (Cambridge University Press. 16s.).

The authors are Professors of Physics in McGill University, Montreal. In this book they examine in detail the various methods of applied geophysics employed in the search for minerals, and describe the instruments used. Practical details of work in the field are given, and while the book will appeal most to the practical geologist, geophysicist and mining engineer, there is much in it which will interest the non-technical reader. The authors point out that just as medical science has benefited mankind to an extent incomparably greater than the miracle of Lourdes, so scientific methods of geophysical prospecting outstrip the dubious methods of the divining rod and "the chance guess of the wild cat." The tremendous output of metals and of oil during the past century has been mainly due to the combination of research and practice in chemistry, physics, mineralogy and metallurgy, and of their use by competent mining engineers.

*Crete, Past and Present.* By M. N. ELLIADI. (Heath Cranton. 7s 6d.).

Mr. Elliadi is British vice-consul at Candia, the principal port of Crete, and his excellent book, which includes additional chapters by Professor Stephan Xanthoudides, late director of the Candia Museum, and other writers, should do much to recommend the varied interests and attractions of the island as it is to-day to those who know it only for its celebrated archaeological treasures. Apart from its interest in this respect, its flora, its natural beauties and the interesting customs of the natives render the island of special interest to the visitor. As far as the development of trade is concerned, great importance is attached to the harbour at Candia, which has lately been completed by a British firm. It is one of the best equipped in the Mediterranean, and is bound to play an important part in the future. The author

recommends the visitor primarily interested in antiquities also to study the modern customs which have a character of their own especially among the peasantry. In spite of the fact that Crete was the birthplace of M. Venizelos, the Prime Minister of Greece, the island has in many ways been neglected, especially in its communications with the interior; but this reproach is now being removed with a great extension in the construction of modern roads.

In a chapter on the history of Crete, Mr. Elliadi shows that, in spite of the continual invasions to which the island was subjected, the Cretans themselves were more artistic than warlike, as the decorations on their utensils and works of art show. Few examples of early painting or sculpture represent scenes of combat. To Mr. Elliadi's able review, Mr. George P. Baker and Dr. P. L. Giuseppi add chapters on plant collecting, and Professor Xanthoudides provides a useful guide to the Candia Museum.

*Recent Advances in the Study of Plant Viruses.* By KENNETH M. SMITH. (Churchill. 15s.).

The study of virus diseases is a comparatively new branch of plant pathology, but it is of growing importance, and Dr. Smith's able account of this interesting work is welcome. The author is Director of the Potato Virus Research Station at Cambridge, and readers of *Discovery* will recall his article on some recent aspects of the work, published in this journal in June, 1930, and illustrated by some remarkable photographs of the disease in various plants. The book has added interest in the fact that the author has drawn comparisons between the behaviour of similar plant and animal viruses.

It is interesting to learn that infra-red photography, which is finding such wide application in varied fields, is being used in the study of various symptoms in plants. Dr. Smith explains that in working with the "streak" diseases of the potato, difficulty has been experienced in obtaining adequate photographs of the necroses occurring in the dark green leaf by means of panchromatic plates and reflected light. Unless the necrosis is extensive, affected leaves usually give an impression of health when photographed by this method. By the use of the new infra-red plates and filter, however, it has been found possible to obtain photographs giving perfect contrast between the leaf and the necroses. Whereas the panchromatic plates differentiate only between colour differences, the infra-red plates are capable of distinguishing between chemical differences. It seems possible that, in addition to the limited use of recording disease symptoms, infra-red photography may have a much wider application in the detection and differentiation of chemical changes occurring in the living plant.

This is the first comprehensive survey of this important work, the literature which exists being largely inaccessible. Dr. Smith presents his subject in an attractive way and the text is assisted by many good photographs.

*The Romance of the Flying Mail.* By HARRY HARPER and ROBERT BRENARD. (Routledge. 10s. 6d.).

It is just over fourteen years since the first commercial daily air service was opened between London and Paris. This 250 mile route was the beginning of the great Empire air mail organization of to-day, with a route mileage of more than 15,000 miles. It stretches southward from London to Capetown and eastward to India, and is now being extended link by link to Australia. The authors describe for the first time the development of the Empire air mail organization.

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